

LISTING OF CLAIMS

1. (previously presented) An acid copper electroplating composition comprising an aqueous solution of an acid and a copper salt, the improvement comprising the addition of at least one of a carrier compound; a water-soluble, mercapto-containing organic brightener compound; and a leveler compound which comprises an organic compound containing single or multiply positively charged centers; wherein said organic compound is selected from the group consisting of poly(allylamine); poly(allylamine hydrochloride); polyaniline, sulfonated, 5 wt. % in water, 75 mole % sulfonated; poly[bis(2-chloroethyl)ether-alt-1,3-bis[3-(dimethylamino)propyl]urea, quaternized; poly[N,N'-bis(2,2,6,6-tetramethyl-4-piperidiny)]-1,6-hexanediamine-co-2,4-dichloro-6-morpholino-1,3,5-triazine; polyacrylamide; poly(acrylamide-co-diallyldimethylammonium chloride); poly(diallyldimethylammonium chloride); poly(melamine-co-formaldehyde), partially methylated; poly(4-vinylpyridine), 25% cross-linked; and poly(1,2-dihydro-2,2,4-trimethylquinoline).
2. (previously presented) The composition as claimed in claim 1 wherein said acid is sulfuric acid.
3. (previously presented) The composition as claimed in claim 1 wherein said copper salt is selected from the group consisting of copper sulfate, copper acetate, copper fluoborate, cupric nitrate and copper pyrophosphate.
4. (previously presented) The composition as claimed in claim 3 wherein said copper salt is copper sulfate.
5. (previously presented) The composition as claimed in claim 1 wherein said carrier compound is selected from the group consisting of a polysaccharide compound, polyethylene glycol and poly(ethylene oxide).
6. (previously presented) The composition as claimed in claim 5 wherein said polysaccharide carrier is selected from the group consisting of starch, cellulose, amylopectin and amylose.

7. (previously presented) The composition as claimed in claim 1 wherein said water-soluble, mercapto-containing organic brightener is selected from the group consisting of *N*-methylallyl-*N'*-methylthiourea; tetramethylthiuram disulfide; ethylethylthiomethyl sulfoxide; ammonium diethyldithiocarbamate; dimethyl-2-thioxo-1,3-dithiole-4,5-dicarboxylate; 3-mercapto-1-propanesulfonic acid sodium salt; 3-mercapto-1-propanesulfonic acid; bis (2-mercaptoethyl) sulfide; ethylene trithio carbonate; ethanethiol; 2-mercaptoethanol; monothioglycerol (1-thioglycerol); 1,2-ethanedithiol; and thiodiethanol.

8. (previously presented) The composition as claimed in claim 7 wherein said water-soluble, mercapto-containing organic brightener is selected from the group consisting of ammonium diethyldithiocarbamate, 3-mercapto-1-propanesulfonic acid sodium salt, and 3-mercapto-1-propanesulfonic acid.

11. (previously presented) The composition as claimed in claim 7 wherein said organic compound is selected from the group consisting of poly[(bis(2-chloroethyl)ether-alt-1,2-bis[3-(dimethylamino)propyl]urea, quaternized, and poly(diallyl dimethylammonium chloride).

16. (previously presented) The composition as claimed in claim 1 further comprising a brightener/carrier molecule.

17. (previously presented) The composition as claimed in claim 16 wherein said brightener/carrier molecule is polymeric protein.

18. (previously presented) The composition as claimed in claim 1 further comprising a carrier/leveler molecule.

19. (previously presented) The composition as claimed in claim 18 wherein said carrier/leveler molecule is selected from the group consisting of poly[bis(2-chloroethyl)ether-alt-1,3-bis[3-(dimethylamino)propyl] urea, quaternized, and poly(melamine-co-formaldehyde).

20. (previously presented) The composition as claimed in claim 1 wherein the weight ratio of carrier to leveler to brightener ranges from about 0.09 to 47.6 : 0.09 to 47.6 : 0.2 to 4.7 weight/weight percent.
21. (previously presented) An improved method for making an acid copper electroplating bath comprising an aqueous solution of acid and copper salt, the improvement comprising adding to said bath a carrier compound; a water-soluble, mercapto-containing organic brightener compound; and a leveler compound which comprises an organic compound containing single or multiply positively charged centers; wherein said organic compound is selected from the group consisting of poly (allylamine); poly (allylamine hydrochloride); polyaniline, sulfonated, 5 wt. % in water, 75 mole % sulfonated; poly[bis (2-chloroethyl)ether-alt-1,3-bis[3-(dimethylamino)propyl]urea, quaternized; poly[N,N'-bis(2,2,6,6-tetramethyl-4-piperidiny)-1,6-hexanediamine-co-2,4-dichloro-6-morpholino-1,3,5-triazine; polyacrylamide; poly(acrylamide-co-diallyldimethylammonium chloride); poly(diallyldimethylammonium chloride); poly(melamine-co-formaldehyde), partially methylated; poly(4-vinylpyridine), 25% cross-linked; and poly(1,2-dihydro-2,2,4-trimethylquinoline).
22. (previously presented) The method as claimed in claim 21 wherein said carrier compound is selected from the group consisting of a polysaccharide compound, polyethylene glycol and poly(ethylene oxide).
23. (previously presented) The method as claimed in claim 22 wherein said polysaccharide carrier is selected from the group consisting of starch, cellulose, amylopectin and amylose.
24. (previously presented) The method as claimed in claim 21 wherein said water-soluble, mercapto-containing organic brightener is selected from the group consisting of *N*-methylallyl-*N*-methylthiourea; tetramethylthiuram disulfide; ethylethylthiomethyl sulfoxide; ammonium diethyldithiocarbamate; dimethyl-2-thioxo-1,3-dithiole-4,5-dicarboxylate; 3-mercapto-1-propanesulfonic acid sodium salt; 3-mercapto-1-propanesulfonic acid; bis (2-mercaptoethyl) sulfide; ethylene trithio carbonate; ethanethiol; 2-mercaptoethanol; monothioglycerol (1-thioglycerol); 1,2-ethanedithiol; and thiodiethanol.

25. (previously presented) The method as claimed in claim 24 wherein said water-soluble, mercapto-containing organic brightener is selected from the group consisting of ammonium diethyldithiocarbamate, 3-mercapto-1-propanesulfonic acid sodium salt, and 3-mercapto-1-propanesulfonic acid.

28. (previously presented) The method as claimed in claim 25 wherein said organic compound is selected from the group consisting of poly[(bis (2-chloroethyl)ether-alt-1,3-bis [3-(dimethylamino)propyl]urea, quaternized, and poly (diallyldimethylammonium chloride).

33. (previously presented) The method as claimed in claim 21 further comprising a brightener/carrier molecule.

34. (previously presented) The method as claimed in claim 33 wherein said brightener/carrier molecule is polymeric protein.

35. (previously presented) The method as claimed in claim 21 further comprising a carrier/leveler molecule.

36. (previously presented) The method as claimed in claim 35 wherein said carrier/leveler molecule is selected from the group consisting of poly[bis(2-chloroethyl/ether-alt-1,3-bis[3-(dimethylamino)propyl]urea, quaternized, and poly(melamine-co-formaldehyde).

37. (previously presented) The method as claimed in claim 21 further adding at least one of an alkaline source compound and a chloride ion-containing compound.

38. (previously presented) The method as claimed in claim 21 wherein said carrier is present in a range of about 2 to 1000 parts per million, said leveler is present in a range of about 2 to 1000 parts per million and said brightener is present in a range of about 5 to 100 parts per million.

Claims 39-46 (cancelled)

SN 09/583,599

Response to March 11, 2004 Office Action

Claim 49 (cancelled)

Claims 54-65 (cancelled)